



**Evaluating structural controls on Eocene igneous
activity in the Ceduna Sub-Basin, Bight Basin,
offshore South Australia.**

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Abstract

The presence of Middle Eocene extrusive and intrusive rocks within and overlying the Late Cretaceous to Holocene section in the Ceduna Sub-basin presents a potential risk to the associated petroleum systems, especially in exploration blocks EPP44 and EPP45. Igneous activity could possibly have reactivated normal faults in the area, resulting in the elimination of pre-existing fault-related traps. Therefore, igneous activity after hydrocarbon migration and accumulation presents an additional risk that needs to be understood.

2D seismic data was utilised in this study to assess the impact of Eocene igneous activity on hydrocarbon prospectivity in the Ceduna Sub-basin, and in particular, to evaluate the role that normal faults have played in permitting the transfer of magma to shallow crustal levels. Igneous features were mapped. Two-way time maps were generated for the bases of the Dugong, Wobbegong and Hammerhead Supersequences.

Volcanogenic mounds, hydrothermal vents and sills identified on the two-way time maps appear to be spatially linked with normal faults, as they display consistent distribution along the WNW-ESE to NW-SE fault strikes. 80% of mapped volcanogenic mounds and 29% of interpreted hydrothermal vent are related to normal faults. Timing of igneous activity was likely to have occurred “at” or “after” with the last normal faulting event, based on relative chronological analysis between igneous intrusions and normal faults. All results suggest that the magma probably made its way up to shallow crustal levels by using pre-existing normal faults pathways. Fault-dependent traps in block EPP45 and the eastern part of block EPP44 appear to be at high risk of faults reactivation, due to the igneous activity in these areas. The future petroleum exploration program in the central and eastern part of Ceduna Sub-basin should take the impact of igneous activity on trap integrity into account, since fault-dependent traps are the main prospects.

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